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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/421,781	10/19/1999	JUENG GIL LEE	CDST-C130	4608

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EXAMINER

ROY, SIKHA

ART UNIT PAPER NUMBER

2879

DATE MAILED: 01/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/421,781

Applicant(s)

LEE ET AL.

Examiner

Sikha Roy

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 October 1999.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20, 54-60 and 67-69 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 21-53 and 61-66 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-20, 54-60 and 67-69 drawn to, electrode structure classified in class 313, subclass 495.
- II. Claims 21-53, 61-66 drawn to method for forming electrode structure, classified in class 445, subclass 50.

Inventions of Group I and Group II are related as product and process of making it. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process. For example, the product as claimed, can be made as follows: forming the electrode structure by depositing a second dielectric layer on the second electrode as suggested in the claim 61.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Art Unit: 2879

During a telephone conversation with Mr. John Wagner on 12/19/01 a provisional election was made without traverse to prosecute the invention of group I, claims 1-20, 54-60 and 67-69. Affirmation of this election must be made by applicant in replying to this Office action. Claims 21-53 and 61-66 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Priority

The priority document submitted herewith matches with the serial number (09/421781) of this application but has a filing date of January 26, 2000 and different title and inventors and hence thereby priority claim is not considered.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 68 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant

Art Unit: 2879

regards as the invention. Regarding the limitation of "said dielectric" the applicants do not clearly indicate whether the first, second or both the dielectric layers are being referred to thus rendering the claim indefinite.

Claim 69 recites the limitation " said sputtered molybdenum layer" which has not been mentioned earlier. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 20 are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent 5,594,297 to Shen et al.

Regarding claim 1 and 20, Shen et al. disclose (column 3 lines 40-67) a field emission display comprising first conductive electrodes 20 formed on an insulating substrate 30, a resistive layer 40 overlying first electrodes 20, a dielectric layer 70, second conductive electrodes 60 having plurality of apertures formed on the dielectric layer. At least one of the first and second conductive electrodes (layers) is formed of metal alloy comprising titanium tungsten (TiW) and aluminum.

Referring to claims 2 and 3, Shen et al. disclose (column 3 lines 60-67) the second electrodes 60 are arranged as rows of conductive bands across the surface of the substrate and the first electrodes 20 are arranged as columns of conductive bands across the substrate 30 substantially orthogonal to the second electrodes thereby permitting matrix-addressed selection of microtips 50 at the intersection of a row and a column corresponding to a pixel. The two sets of electrodes being orthogonal to each other, the first set of electrodes can be arranged as rows and the second set of electrodes arranged as columns.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of U. S. Patent 6,320,138 to Kamiya et al.

Claims 4-8 differ from Shen et al. in that Shen et al. do not exemplify on the metal alloy of the electrodes made of aluminum alloy comprising .5 to 6 atomic percent neodymium and up to 5 atomic percent titanium.

Referring to claims 4- 8, Kamiya in relevant art conductor formed of low-resistance aluminum alloy discloses (column 5 lines 5,6) Al-Nd-Ti alloy thin film formed with the substrate. It is noted that the occurrence of any hillock and pinhole in the thin film conductor can be suppressed by setting the concentrations of neodymium and titanium. Kamiya discloses (column 7 lines 10-16) the conductor made of an aluminum alloy consisting essentially of aluminum, neodymium and titanium setting the concentration of neodymium and titanium from at least about 0.1 atomic % to 3.5 atomic %.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the alloy of the conducting electrodes of Shen et al. by aluminum alloy comprising neodymium and titanium as taught by Kamiya for suppressing the hillock and pinhole occurrences in the thin film conductor.

Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of U. S. Patent 5,894,188 to Chakvorty et al.

Regarding claims 9 and 10, Shen et al. do not disclose a cladding layer comprising molybdenum and tungsten disposed over the metal alloy of the first electrode.

Chakvorty et al. in analogous art of metal for flat panel display disclose (Column 5 lines 60,61 Fig. 1C) a cladding layer 104 deposited on the electrode 103. Chakvorty et al. further disclose (column 8 lines 19-26) that the refractory metals molybdenum and tungsten which are easy to process and make good electrical contact with aluminum

conductors are used as cladding layer so as to seal each aluminum strip forming row or column metal strips.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to add to the first electrodes of Shen et al. cladding layer of molybdenum and titanium as suggested by Chakvorty for sealing each electrode.

Claims 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of U. S. Patent 6,265,822 to Kuroda et al.

Regarding claims 11,12,14,16, Shen et al. do not exemplify on metal alloy comprising silver alloy having palladium, copper and titanium.

Kuroda et al. in relevant art of electron beam apparatus disclose (column 15 lines 61-67) cold cathode elements disposed in matrix pattern and the conductive material used for electrodes selected from metals such as Mo, W, Ti, Cu, Pd and Ag and alloys of these metals. It is further noted these metals and their alloys can be formed easily in the form of a fine particle film having excellent electron emission characteristics and can be manufactured easily (column 15 lines 22-25). The lower the content of the transition metal (copper, palladium) the lower becomes the thin film resistance when the electrode serve as a wiring conductive layer.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the metal alloy of the electrodes of Shen et al. by silver alloy comprising palladium, copper and titanium as disclosed by Kuroda et al. for forming the electrodes easily by vapor deposition in the form of thin film with excellent emission characteristics.

Regarding claims 13,15 and 17 Shen et al. in view of Kuroda et al. disclose the claimed invention except for the limitation of range of concentration of palladium, copper and titanium from .5 to 2 atomic percent. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide range of concentration from .5 to 2 atomic percent, since optimization of workable ranges is considered within the skill of the art.

Claims 18, 19, 54 and 55 are rejected under 35 U.S.C. 103(a) as being - unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of U. S. Patent 6,064,149 to Raina.

Regarding claims 18,19, Shen et al. do not disclose a passivation layer comprising of silicon nitride disposed over the plurality of second electrodes.

Raina in analogous art of field emission device discloses (column 8 lines38-42 Fig.4) a passivation layer 56 consisting of silicon nitride formed over the gate metal layer. It is to be noted that this passivation layer protects the entire set of layers underneath.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to add to the second electrodes of Shen et al. a passivation layer of silicon nitride as taught by Raina to protect the conductive second electrodes and dielectric layer underneath.

Referring to claims 54 and 55 Shen et al. disclose all the limitations except that of passivation layer comprising of silicon nitride disposed over the second electrodes which has been recited in claims 18, 19. Therefore claims 54 and 55 are rejected for the same reason as claims 18,19.

Claims 56-58, 60 and 67,68 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of U. S. Patent 6,064,149 to Raina and further in view of WO 98/43268 to Amey.

Regarding claims 56-58, Shen et al. and Raina do not disclose a gate structure disposed over the passivation layer of silicon nitride or between the second electrodes and passivation layer or between the second electrodes and the dielectric layer.

Amey in pertinent art of field emitter cathode backplate structures discloses (page 7 lines 8-12 fig. 3(a)) a gate structure (electrical conductor 17) formed over a dielectric layer 15 for serving as additional control or focusing the electrons.

Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to add a gate structure as taught by Amey on the passivation layer of Shen et al. and Raina for additional control or focusing the electron from the emitter.

Regarding claims 57,58 Shen et al. in view of Raina and Amey disclose the claimed invention except for the limitation of gate structure disposed between the second electrodes and passivation layer and between the second electrodes and the dielectric layer. It has been held that rearranging of parts of an invention involves only routine skills in the art. *In re Japikse*, 86 USPQ 70. Thus, it would have been obvious to one having ordinary skills in the art the time the invention was made to dispose the gate

structure between the second electrodes and passivation layer or between the second electrodes and the dielectric layer., since rearrangement of parts of an invention is considered within the skills of the art.

Regarding claim 60, Shen et al. in view of Raina and Amey disclose the claimed invention except for the limitation of the second dielectric layer (15) disposed over the layer of silicon nitride. It has been held that rearranging of parts of an invention involves only routine skills in the art. *In re Japikse*, 86 USPQ 70. Thus, it would have been obvious to one having ordinary skills in the art the time the invention was made to dispose the second dielectric layer disposed between the second electrodes and the silicon nitride layer.

Claims 67 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view of WO 98/43268 to Amey.

Regarding claim 67, Shen et al. disclose all the limitations with the exception of the second dielectric layer disposed over the plurality of second electrodes. Amey discloses a second dielectric layer 15 (page 7 lines 5-10, Fig 3(a)) completely covering the planar surface of the conductor 14 patterned for separating a plurality of electrodes.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to dispose a second dielectric layer disposed on the second electrodes of Shen et al. as disclosed by Amey for separating plurality of electrodes.

Regarding claim 68, Chen et al. disclose (column 5 lines 63,64) dielectric layers typically comprises silicon dioxide.

Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,594,297 to Shen et al. in view in view of U. S. Patent 6,064,149 to Raina, in view of WO 98/43268 to Amey and further in view of U. S. Patent 5,894,188 to Chakvorty et al.

Shen et al. in view of Raina and Amey do not disclose a tantalum structure disposed between the gate structure and second electrodes.

Chakvorty et al. disclose a cladding layer of tantalum on the first electrodes which makes good electrical contact with the overlying layer. It is further noted tantalum does not inter diffuse with aluminum.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to dispose one layer of tantalum between gate structure (additional conducting electrode for focusing) and second electrodes as separating layer making good electrical contact and preventing any inter diffusion of conducting layers.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U. S. Patent 5,191,217 to Kane et al., U. S. Patent 6,313,572 to Yamada and U. S. Patent 6,326,725 to Xia disclose electron emission device with plural gate structures. U. S. Patent 6,163,110 to Arai and U. S. Patent 6,180,030 to Hirai et al. disclose materials for conductive films.

Art Unit: 2879

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

S.R.

Sikha Roy
Patent Examiner
Art Unit 2879



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